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EXAMINER	
WILKINS III, HARRY D	
ART UNIT	PAPER NUMBER
1742	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/21/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/767,253	SUZUKI ET AL.	
	Examiner	Art Unit	
	Harry D. Wilkins, III	1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 January 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-77* is/are pending in the application.

4a) Of the above claim(s) *39-77* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-38* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/12/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Group I, claims 1-38 in the reply filed on 11 January 2007 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-15 and 25-32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "high resistance structure" in claims 1, 3-7 and 25-27, is a relative term which renders the claim indefinite. The term "high resistance structure" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Any structure with a resistance higher than that of the electrolyte would be considered a "high resistance structure", such as an ion-exchange membrane, a porous ceramic diffuser, etc. Applicant has failed to provide a requisite definition for the claim term to clearly define the metes and bounds of the claim.

4. Claims 14 and 23 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between

the elements. See MPEP § 2172.01. The omitted elements are: the fact that the multiple pumps are connected to multiple, different introducing portions (104), such as can be seen in figures 18A and 18B. Applicant has not disclosed nor enabled how multiple pumps could be connected to a single introducing portion (104) to enable delivery of the electrolytic solution at spaced time intervals.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 16, 18, 20, 22, 24, 33, 35, 37 and 38 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Hosten et al (WO 01/12882, with reference to its English equivalent US 6,949,172).

Hosten et al anticipate the invention as claimed. Hosten et al teach (see abstract, figures 1 and 2 and col. 3, line 58-col. 4, line 10 of '172 patent) an electrolytic processing apparatus including a substrate holder (5) for holding a substrate (3), a first electrode (4) for contacting the substrate to supply current to a surface to be processed of the substrate, a second electrode (6, 14) disposed substantially parallel to the surface of the substrate in a position facing the surface, an electrolytic solution injecting part (7) which injected the electrolyte from a position lateral of the substrate and a power source (not shown).

Regarding claim 33, the apparatus of Hosten et al further included an electrolytic solution withdrawing portion (8) for removing electrolyte from the region between the substrate and electrode, where the portion (8) was located lateral to the substrate.

Regarding claims 18 and 35, the ends of the introduction portion were formed as nozzles.

Regarding claims 20 and 37, the introduction and removing portions of the apparatus of Hosten et al included portions disposed in positions disposed along a circumferential direction of a peripheral edge of the substrate (see esp. figure 2).

Regarding claim 22, the substrate holder of Hosten et al was rotatable.

Regarding claim 24, the apparatus of Hosten et al would have been capable of operating in the claimed fashion since it provided linear flow from one peripheral edge to the opposite peripheral edge of the substrate.

Regarding claim 38, the introducing portion and the withdrawing portion faced each other across the substrate (see esp. figure 2).

7. Claims 1, 2, 4, 5, 9, 11, 13, 15, 16, 18, 20, 22, 24-26, 29, 31-33, 35, 37 and 38 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Reynolds (US 5,597,460).

Reynolds anticipates the invention as claimed. Reynolds teaches (see abstract and figures 1-3) an electroplating apparatus including a substrate holder (18) for holding a substrate, a first electrode (not shown) for contacting the substrate to supply current to the surface of the substrate to be processed, a second electrode (26) disposed substantially parallel to the surface of the substrate, a high resistance structure (20)

disposed between the substrate and the second electrode, an electrolytic solution introduction portion (46) located lateral of the high resistance structure and a power source (not shown) for energizing the first and second electrodes.

Regarding claim 16, Reynolds teaches (see abstract and figures 1-3) an electroplating apparatus including a substrate holder (18) for holding a substrate, a first electrode (not shown) for contacting the substrate to supply current to the surface of the substrate to be processed, a second electrode (26) disposed substantially parallel to the surface of the substrate, an electrolytic solution introduction portion (46) located lateral of the high resistance structure and a power source (not shown) for energizing the first and second electrodes.

Regarding claim 25, Reynolds teaches (see abstract and figures 1-3) an electroplating apparatus including a substrate holder (18) for holding a substrate, a first electrode (not shown) for contacting the substrate to supply current to the surface of the substrate to be processed, a second electrode (26) disposed substantially parallel to the surface of the substrate, a high resistance structure (20) disposed between the substrate and the second electrode, an electrolytic solution introduction portion (46) located lateral of the high resistance structure, an electrolytic solution withdrawing portion (top of weir 20) located lateral of the high resistance structure and a power source (not shown) for energizing the first and second electrodes.

Regarding claim 33, Reynolds teaches (see abstract and figures 1-3) an electroplating apparatus including a substrate holder (18) for holding a substrate, a first electrode (not shown) for contacting the substrate to supply current to the surface of the

substrate to be processed, a second electrode (26) disposed substantially parallel to the surface of the substrate, an electrolytic solution introduction portion (46) located lateral of the substrate, an electrolytic solution withdrawing portion (top of weir 20) located lateral of the substrate and a power source (not shown) for energizing the first and second electrodes.

Regarding claims 2 and 26, Reynolds teaches (see figure 3) forming the introducing portion integral with the electrode holder, which holds the electrode (26) and the high resistance structure (20).

Regarding claims 4 and 5, since the claims do not explicitly define the structure required to form an air ejecting portion and an air drawing portion, a device having the region between the substrate and the second electrode/high resistance structure open to atmosphere would have been capable of ejecting air into and withdrawing air out of the region.

Regarding claims 9, 18, 29 and 35, the ends of the introduction portion (46) were formed as nozzles.

Regarding claims 11, 20, 31 and 37, the introduction and removing portions of the apparatus of Reynolds included portions disposed in positions disposed along a circumferential direction of a peripheral edge of the substrate (see esp. figure 3).

Regarding claims 13 and 22, the substrate holder of Reynolds is rotatable.

Regarding claims 15 and 24, the apparatus of Reynolds would have been capable of operating in the claimed fashion since it provided linear flow from one peripheral edge to the opposite peripheral edge of the substrate.

Regarding claims 32 and 38, the introducing portion and the withdrawing portion faced each other across the substrate (see esp. figure 3).

8. Claims 1, 3-5, 12, 16, 21 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Hanson et al (US 6,368,475).

Hanson et al anticipate the invention as claimed. Hanson et al teach (see figures 1-4) an electroplating apparatus including a substrate holder (20), a first electrode (not shown) for contacting the substrate to supply current to the surface of the substrate to be processed, a second electrode (26) disposed substantially parallel to the surface of the substrate, a high resistance structure (115) disposed between the substrate and second electrode, a power source and an electrolytic solution introducing portion (top of part 80) that was disposed laterally of the high resistance structure.

Regarding claim 16, Hanson et al teach (see figures 1-4) an electroplating apparatus including a substrate holder (20), a first electrode (not shown) for contacting the substrate to supply current to the surface of the substrate to be processed, a second electrode (26) disposed substantially parallel to the surface of the substrate, a power source and an electrolytic solution introducing portion (top of part 80) that was disposed laterally of the high resistance structure.

Regarding claim 3, the electrode holder held the second electrode and the high resistance structure and the introducing portion was disposed laterally of the electrode holder.

Regarding claims 4 and 5, since the claims do not explicitly define the structure required to form an air ejecting portion and an air drawing portion, a device having the

region between the substrate and the second electrode/high resistance structure open to atmosphere would have been capable of ejecting air into and withdrawing air out of the region.

Regarding claims 9 and 18, the distal end of the introducing portion was formed as a slit.

Regarding claims 11 and 20, the introducing portion was formed in positions along the circumferential direction of a peripheral edge of the substrate.

Regarding claims 12 and 21, the introducing portion was disposed in positions facing each other across the substrate.

Regarding claims 13 and 22, the substrate holder was rotatable.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 19 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosten et al (WO 01/12882, with reference to its English equivalent US 6,949,172).

The teachings of Hosten et al are disclosed above.

Hosten et al do not teach including a check valve in the introducing section.

However, it would have been obvious to one of ordinary skill in the art to have put a check valve in the introducing section, such as in pipe 11, to ensure that flow of

electrolyte always proceeded in the desired direction and to prevent electrolyte from flow backwards through the electrolytic cell.

11. Claims 10, 19, 30 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reynolds (US 5,597,460).

The teachings of Reynolds are disclosed above.

Reynolds does not teach including a check valve in the introducing section.

However, it would have been obvious to one of ordinary skill in the art to have put a check valve in the introducing section, such as in pipe 44, to ensure that flow of electrolyte always proceeded in the desired direction and to prevent electrolyte from flow backwards through the electroplating cell.

12. Claims 10 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanson et al (US 6,368,475).

The teachings of Hanson et al are disclosed above.

Hanson et al do not teach including a check valve in the introducing section.

However, it would have been obvious to one of ordinary skill in the art to have put a check valve in the introducing section, such as in pipe 155, to ensure that flow of electrolyte always proceeded in the desired direction and to prevent electrolyte from flow backwards through the electrolytic cell.

13. Claims 17 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosten et al (WO 01/12882, with reference to its English equivalent US 6,949,172) in view of Dordi et al (US 2001/0052465).

The teachings of Hosten et al are described above.

Hosten et al do not teach including a deaerating device in the electrolyte flow system.

However, Dordi et al teach (see figures 26A and 26B and paragrasph 123-124) that degasser modules were included in electrolyte recirculation loops for the purpose of removing entrained gas, which could form bubbles within the electroplating cell, thereby increasing electroplating uniformity by preventing the formation of bubbles.

Therefore, it would have been obvious to one of ordinary skill in the art to have added the degasser modules taught by Dordi et al to the apparatus of Hosten et al for the purpose of preventing bubbles from forming within the electroplating cell, to thereby enhance electroplating uniformity.

14. Claims 8, 17, 28 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reynolds (US 5,597,460) in view of Dordi et al (US 2001/0052465).

The teachings of Reynolds are disclosed above.

Reynolds does not teach including a deaerating device in the electrolyte flow system.

However, Dordi et al teach (see figures 26A and 26B and paragrasph 123-124) that degasser modules were included in electrolyte recirculation loops for the purpose of removing entrained gas, which could form bubbles within the electroplating cell, thereby increasing electroplating uniformity by preventing the formation of bubbles.

Therefore, it would have been obvious to one of ordinary skill in the art to have added the degasser modules taught by Dordi et al to the apparatus of Reynolds for the

purpose of preventing bubbles from forming within the electroplating cell, to thereby enhance electroplating uniformity.

15. Claims 8 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanson et al (US 6,368,475) in view of Dordi et al (US 2001/0052465).

The teachings of Hanson et al are described above.

Hanson et al do not teach including a deaerating device in the electrolyte flow system.

However, Dordi et al teach (see figures 26A and 26B and paragrasph 123-124) that degasser modules were included in electrolyte recirculation loops for the purpose of removing entrained gas, which could form bubbles within the electroplating cell, thereby increasing electroplating uniformity by preventing the formation of bubbles.

Therefore, it would have been obvious to one of ordinary skill in the art to have added the degasser modules taught by Dordi et al to the apparatus of Hosten et al for the purpose of preventing bubbles from forming within the electroplating cell, to thereby enhance electroplating uniformity.

16. Claims 1, 3, 9-11, 13, 15, 25, 27 and 29-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosten et al (WO 01/12882, with reference to its English equivalent US 6,949,172) in view of Kunisawa et al (US 2002/0020627).

Hosten et al (as above) teach an electrolytic processing apparatus including a substrate holder (5) for holding a substrate (3), a first electrode (4) for contacting the substrate to supply current to a surface to be processed of the substrate, a second electrode (6, 14) disposed substantially parallel to the surface of the substrate in a

position facing the surface, an electrolytic solution injecting part (7) which injected the electrolyte from a position lateral of the substrate and a power source (not shown).

Thus, Hosten et al fail to teach providing a high resistance structure disposed between the substrate and the second electrode.

Kunisawa et al teach (see abstract, figures 39-41, and paragraphs 245-253) that placement of a high resistance structure, a plate made of porous alumina, between the anode and a substrate creates an overall leveling effect for the current density at the substrate surface, thereby increasing the uniformity of the electroplated layer in terms of thickness.

Therefore, it would have been obvious to one of ordinary skill in the art to have added the high resistance structure taught by Kunisawa et al to the apparatus of Hosten et al for the purpose of increasing uniformity of the electroplated layer thickness.

Regarding claim 25, the apparatus of Hosten et al further included an electrolytic solution withdrawing portion (8) for removing electrolyte from the region between the substrate and electrode, where the portion (8) was located lateral to the substrate.

Regarding claims 3 and 27, the apparatus of Hosten et al included an electrode holder (box around item 14) that held the second electrode, and would have held the high resistance structure of Kunisawa et al at the position of the grid disclosed by Hosten et al (15). Thus, the introducing portion was disposed laterally of the electrode holder.

Regarding claims 9 and 29, the ends of the introduction portion were formed as nozzles.

Regarding claims 10 and 30, it would have been obvious to one of ordinary skill in the art to have put a check valve in the introducing section, such as in pipe 11, to ensure that flow of electrolyte always proceeded in the desired direction and to prevent electrolyte from flow backwards through the electrolytic cell.

Regarding claims 11 and 31, the introduction and removing portions of the apparatus of Hosten et al included portions disposed in positions disposed along a circumferential direction of a peripheral edge of the substrate (see esp. figure 2).

Regarding claim 13, the substrate holder of Hosten et al was rotatable.

Regarding claim 15, the apparatus of Hosten et al would have been capable of operating in the claimed fashion since it provided linear flow from one peripheral edge to the opposite peripheral edge of the substrate.

Regarding claim 32, the introducing portion and the withdrawing portion faced each other across the substrate (see esp. figure 2).

17. Claims 8 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosten et al (WO 01/12882, with reference to its English equivalent US 6,949,172) in view of Kunisawa et al (US 2002/0020627) as applied above to claims 1 and 25, and further in view of Dordi et al (US 2001/0052465).

The teachings of Hosten et al are described above.

Hosten et al do not teach including a deaerating device in the electrolyte flow system.

However, Dordi et al teach (see figures 26A and 26B and paragrasph 123-124) that degasser modules were included in electrolyte recirculation loops for the purpose of

removing entrained gas, which could form bubbles within the electroplating cell, thereby increasing electroplating uniformity by preventing the formation of bubbles.

Therefore, it would have been obvious to one of ordinary skill in the art to have added the degasser modules taught by Dordi et al to the apparatus of Hosten et al for the purpose of preventing bubbles from forming within the electroplating cell, to thereby enhance electroplating uniformity.

18. Claims 1, 2, 9-11, 13, 15, 25, 26 and 29-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reynolds (US 5,597,460) in view of Kunisawa et al (US 2002/0020627).

Since the high resistance structure taught by Reynolds was an ion-exchange membrane (see col. 3, lines 44-49), and Applicant discloses the high resistance structure being a plate of porous alumina, it is possible to say that the membrane of Reynolds was not a high resistance structure.

Reynolds (as above) teaches an electroplating apparatus including a substrate holder (18) for holding a substrate, a first electrode (not shown) for contacting the substrate to supply current to the surface of the substrate to be processed, a second electrode (26) disposed substantially parallel to the surface of the substrate, an electrolytic solution introduction portion (46) located lateral of the high resistance structure and a power source (not shown) for energizing the first and second electrodes.

Reynolds fails to teach providing a high resistance structure, such as a porous alumina plate, disposed between the substrate and the second electrode.

Kunisawa et al teach (see abstract, figures 39-41, and paragraphs 245-253) that placement of a high resistance structure, a plate made of porous alumina, between the anode and a substrate creates an overall leveling effect for the current density at the substrate surface, thereby increasing the uniformity of the electroplated layer in terms of thickness.

Therefore, it would have been obvious to one of ordinary skill in the art to have added the high resistance structure taught by Kunisawa et al to the apparatus of Reynolds for the purpose of increasing uniformity of the electroplated layer thickness.

Regarding claim 25, the apparatus of Reynolds further included an electrolytic solution withdrawing portion (top of weir 20) for removing electrolyte from the region between the substrate and electrode, where the portion was located lateral to the substrate.

Regarding claims 2 and 26, Reynolds teaches (see figure 3) forming the introducing portion integral with the electrode holder, which holds the electrode (26) and would have held the high resistance structure of Kunisawa et al at the position of the ion-exchange membrane of Reynolds. Thus, the introducing portion (46) was unitary with the electrode holder.

Regarding claims 9 and 29, the ends of the introduction portion (46) were formed as nozzles.

Regarding claims 10 and 30, it would have been obvious to one of ordinary skill in the art to have put a check valve in the introducing section, such as in pipe 44, to

ensure that flow of electrolyte always proceeded in the desired direction and to prevent electrolyte from flow backwards through the electrolytic cell.

Regarding claims 11 and 31, the introduction and removing portions of the apparatus of Reynolds included portions disposed in positions disposed along a circumferential direction of a peripheral edge of the substrate (see esp. figure 3).

Regarding claim 13, the substrate holder of Reynolds is rotatable.

Regarding claim 15, the apparatus of Reynolds would have been capable of operating in the claimed fashion since it provided linear flow from one peripheral edge to the opposite peripheral edge of the substrate.

Regarding claim 32, the introducing portion and the withdrawing portion faced each other across the substrate (see esp. figure 3)

19. Claims 8 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reynolds (US 5,597,460) in view of Kunisawa et al (US 2002/0020627) as applied above to claims 1 and 25, and further in view of Dordi et al (US 2001/0052465).

The teachings of Reynolds are described above.

Reynolds does not teach including a deaerating device in the electrolyte flow system.

However, Dordi et al teach (see figures 26A and 26B and paragrasph 123-124) that degasser modules were included in electrolyte recirculation loops for the purpose of removing entrained gas, which could form bubbles within the electroplating cell, thereby increasing electroplating uniformity by preventing the formation of bubbles.

Therefore, it would have been obvious to one of ordinary skill in the art to have added the degasser modules taught by Dordi et al to the apparatus of Reynolds for the purpose of preventing bubbles from forming within the electroplating cell, to thereby enhance electroplating uniformity.

20. Claims 1, 2, 4-7, 9-11, 13, 15, 16, 18-20, 22, 24-26, 29-33, and 35-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kunisawa et al (US 2002/0020627) in view of Reynolds (US 5,597,460).

Kunisawa et al teach (see e.g.-figures 28, 30, 39, 40, 42, etc.) an electroplating apparatus including a substrate holder, a first electrode for contacting a surface of the substrate to be plated, a second electrode positioned substantially parallel to the substrate, a high resistance structure disposed between the substrate and second electrode, a power source and an electrolyte introduction portion.

However, the electrolyte introduction portion did not introduce electrolyte from lateral of the high resistance structure.

Reynolds teaches (see abstract, figures 1-3 and col. 3) that highly uniform electroplating can be performed by instituting a flow regime such that the electrolyte passes only in one direction across the substrate surface with a uniform flow profile across the width of the substrate surface.

Therefore, it would have been obvious to one of ordinary skill in the art to have instituted an across-face electrolyte flow scheme as taught by Reynolds within the apparatus of Kunisawa et al by permitting the electrolyte to flow from a position lateral of

the substrate/second electrode/high resistance structure in order to permit more uniform electroplating to occur, as suggested by Reynolds.

Regarding claim 16, Kunisawa et al teach (see e.g.-figures 28, 30, 39, 40, 42, etc.) an electroplating apparatus including a substrate holder, a first electrode for contacting a surface of the substrate to be plated, a second electrode positioned substantially parallel to the substrate, a power source and an electrolyte introduction portion. However, the electrolyte introduction portion did not introduce electrolyte from lateral of the high resistance structure. Reynolds teaches (see abstract, figures 1-3 and col. 3) that highly uniform electroplating can be performed by instituting a flow regime such that the electrolyte passes only in one direction across the substrate surface with a uniform flow profile across the width of the substrate surface. Therefore, it would have been obvious to one of ordinary skill in the art to have instituted an across-face electrolyte flow scheme as taught by Reynolds within the apparatus of Kunisawa et al by permitting the electrolyte to flow from a position lateral of the substrate in order to permit more uniform electroplating to occur, as suggested by Reynolds.

Regarding claim 25, Kunisawa et al teach (see e.g.-figures 28, 30, 39, 40, 42, etc.) an electroplating apparatus including a substrate holder, a first electrode for contacting a surface of the substrate to be plated, a second electrode positioned substantially parallel to the substrate, a high resistance structure disposed between the substrate and the second electrode, a power source and an electrolyte introduction portion. However, the electrolyte introduction portion did not introduce electrolyte from lateral of the high resistance structure. Reynolds teaches (see abstract, figures 1-3 and

col. 3) that highly uniform electroplating can be performed by instituting a flow regime such that the electrolyte passes only in one direction across the substrate surface with a uniform flow profile across the width of the substrate surface. Therefore, it would have been obvious to one of ordinary skill in the art to have instituted an across-face electrolyte flow scheme as taught by Reynolds within the apparatus of Kunisawa et al by permitting the electrolyte to flow from a position lateral of the substrate to the opposite side in order to permit more uniform electroplating to occur, as suggested by Reynolds.

Regarding claim 33, Kunisawa et al teach (see e.g.-figures 28, 30, 39, 40, 42, etc.) an electroplating apparatus including a substrate holder, a first electrode for contacting a surface of the substrate to be plated, a second electrode positioned substantially parallel to the substrate, a power source and an electrolyte introduction portion. However, the electrolyte introduction portion did not introduce electrolyte from lateral of the high resistance structure. Reynolds teaches (see abstract, figures 1-3 and col. 3) that highly uniform electroplating can be performed by instituting a flow regime such that the electrolyte passes only in one direction across the substrate surface with a uniform flow profile across the width of the substrate surface. Therefore, it would have been obvious to one of ordinary skill in the art to have instituted an across-face electrolyte flow scheme as taught by Reynolds within the apparatus of Kunisawa et al by permitting the electrolyte to flow from a position lateral of the substrate to the opposite side in order to permit more uniform electroplating to occur, as suggested by Reynolds.

Regarding claims 2 and 26, Reynolds teaches (see figure 3) forming the introducing portion integral with the electrode holder, which holds the electrode (26) and the high resistance structure (20). Kunisawa et al also teach (see figure 28) forming the introducing portion integral with the electrode holder.

Regarding claims 4 and 5, since the claims do not explicitly define the structure required to form an air ejecting portion and an air drawing portion, a device having the region between the substrate and the second electrode/high resistance structure open to atmosphere would have been capable of ejecting air into and withdrawing air out of the region.

Regarding claims 6 and 7, Kunisawa et al teach (see paragraph 212) that the high resistance structure was capable of vertical and/or tilting motion. Thus, the structure of Kunisawa et al and Reynolds was capable of operating in the claimed fashion.

Regarding claims 9, 18, 29 and 35, the ends of the introduction portion (46) were formed as nozzles.

Regarding claims 10, 19, 30 and 36, it would have been obvious to one of ordinary skill in the art to have put a check valve in the introducing section, such as in pipe 104, to ensure that flow of electrolyte always proceeded in the desired direction and to prevent electrolyte from flow backwards through the electroplating cell.

Regarding claims 11, 20, 31 and 37, the introduction and removing portions of the apparatus of Reynolds included portions disposed in positions disposed along a circumferential direction of a peripheral edge of the substrate (see esp. figure 3).

Regarding claims 13 and 22, the substrate holders of both Kunisawa et al and Reynolds are rotatable.

Regarding claims 15 and 24, the apparatus of Kunisawa et al in view of Reynolds would have been capable of operating in the claimed fashion since it provided linear flow from one peripheral edge to the opposite peripheral edge of the substrate.

Regarding claims 32 and 38, the introducing portion and the withdrawing portion faced each other across the substrate (see esp. figure 3)

21. Claims 8, 17, 28 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kunisawa et al (US 2002/0020627) in view of Reynolds (US 5,597,460) as applied to claims 1, 16, 25 and 33 above, and further in view of Dordi et al (US 2001/0052465).

The teachings of Kunisawa et al and Reynolds are disclosed above.

Neither of Kunisawa et al and Reynolds teach including a deaerating device in the electrolyte flow system.

However, Dordi et al teach (see figures 26A and 26B and paragrasph 123-124) that degasser modules were included in electrolyte recirculation loops for the purpose of removing entrained gas, which could form bubbles within the electroplating cell, thereby increasing electroplating uniformity by preventing the formation of bubbles.

Therefore, it would have been obvious to one of ordinary skill in the art to have added the degasser modules taught by Dordi et al to the apparatus of Kunisawa et al and Reynolds for the purpose of preventing bubbles from forming within the electroplating cell, to thereby enhance electroplating uniformity.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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